Chapter 2
Terms and Abbreviations

This chapter lists and defines terms and abbreviations used throughout this specification.

Access.bus	The Access.bus is developed by the Access.bus Industry Group, based on the Phillips I^2C technology and a DEC software model. Revision 2.2 specifies the bus for 100 kbs operation, but the technology has headroom to go up to 400 kbs.
ACK	Acknowledgment. Handshake packet indicating a positive acknowledgment.
Active Device	A device that is powered and not in the suspend state.
ADB	See Apple Desktop Bus.
APM	An acronym for Advanced Power Management. APM is a specification for managing suspend and resume operations to conserve power on a host system.
Apple Desktop Bus	An expansion bus used by personal computers manufactured by Apple Computer, Inc.
Asynchronous Data	Data transferred at irregular intervals with relaxed latency requirements.
Asynchronous RA	The incoming data rate, Fs_i, and the outgoing data rate, Fs_o, of the RA process are independent (i.e., no shared master clock).
Asynchronous SRC	The incoming sample rate, Fs_i, and outgoing sample rate, Fs_o, of the SRC process are independent (i.e., no shared master clock).
Audio Device	A device that sources or sinks sampled analog data.
AWG#	The measurement of wire's cross section as defined by the American Wire Gauge standard.
Babble	Unexpected bus activity that persists beyond a specified point in a frame.
Bandwidth	The amount of data transmitted per unit of time, typically bits per second (bps) or bytes per second (Bps).
Big Endian	Method of storing data that places the most significant byte of multiple byte values at a lower storage addresses. For example, a word stored in big endian format places the least significant byte at the higher address and the most significant byte at the lower address. See little endian.
Bit	A unit of information used by digital computers. Represents the smallest piece of addressable memory within a computer. A bit expresses the choice between two possibilities and is typically represented by a logical one (1) or zero (0).
Bit Stuffing	Insertion of a "0" bit into a data stream to cause a electrical transition on the data wires allowing a PLL to remain locked.
bps	Transmission rate expressed in bits per second.
Bps	Transmission rate expressed in bytes per second.

Buffer	Storage used to compensate for a difference in data rates or time of occurrence of events, when transmitting data from one device to another.
Bulk Transfer	Non periodic, large bursty communication typically used for a transfer that can use any available bandwidth and also be delayed until bandwidth is available.
Bus Enumeration	Detecting and identifying Universal Serial Bus devices.
Byte	A data element that is eight bits in size.
Capabilities	Those attributes of a Universal Serial Bus device that are administerable by the host.
Characteristics	Those qualities of a Universal Serial Bus device that are unchangeable; for example, the device class is a device characteristic.
CHI	An acronym for Concentration Highway Interface. CHI is a full duplex time division multiplexed serial interface for digitized voice transfers in communications systems. The current specification supports data transfer rates up to 4.096 Mbs.
Client	Software resident on the host that interacts with host software to arrange data transfer between a function and the host. The client is often the data provider and consumer for transferred data.
COM Port	Communications port. On personal computers, an eight-bit asynchronous serial port is typically used.
Configuring Software	The host software responsible for configuring a Universal Serial Bus device. This may be a system configurator or software specific to the device.
Control Pipe	Same as a message pipe.
Control Transfer	One of four Universal Serial Bus Transfer Types. Control transfers support configuration/command/status type communications between client and function.
CRC	See Cyclic Redundancy Check.
CTI	Computer Telephony Integration.
Cyclic Redundancy Check	A check performed on data to see if an error has occurred in transmitting, reading, or writing the data. The result of a CRC is typically stored or transmitted with the checked data. The stored or transmitted result is compared to a CRC calculated for the data to determine if an error has occurred.
Default Address	An address defined by the Universal Serial Bus Specification and used by a Universal Serial Bus device when it is first powered or reset. The default address is 00h.
Default Pipe	The message pipe created by Universal Serial Bus system software to pass control and status information between the host and a Universal Serial Bus device's Endpoint 0.

Device	A logical or physical entity that performs a function. The actual entity described depends on the context of the reference. At the lowest level, device may refer to a single hardware component, as in a memory device. At a higher level, it may refer to a collection of hardware components that perform a particular function, such as a Universal Serial Bus interface device. At an even higher level, device may refer to the function performed by an entity attached to the Universal Serial Bus; for example, a data/FAX modem device. Devices may be physical, electrical, addressable, and logical. When used as a non-specific reference, a Universal Serial Bus device is either a hub or a function.
Device Address	The address of a device on Universal Serial Bus. The Device Address is the Default Address when the Universal Serial Bus device is first powered or reset. Hubs and functions are assigned a unique Device Address by Universal Serial Bus software.
Device Endpoint	A uniquely identifiable portion of a Universal Serial Bus device that is the source or sink of information in a communication flow between the host and device.
Device Resources	Resources provided by Universal Serial Bus devices, such as buffer space and endpoints. See Host Resources and Universal Serial Bus Resources.
Device Software	Software that is responsible for using a Universal Serial Bus device. This software may or may not also be responsible for configuring the device for use.
DMI	An acronym for Desktop Management Interface. A method for managing host system components developed by the Desktop Management Task Force.
Downstream	The direction of data flow from the host or away from the host. A downstream port is the port on a hub electrically farthest from the host that generates downstream data traffic from the hub. Downstream ports receive upstream data traffic.
Driver	When referring to hardware, an I/O pad that drives an external load. When referring to software, a program responsible for interfacing to a hardware device. That is, a device driver.
DWORD	Double word. A data element that is 2 words, 4 bytes, or 32 bits in size.
Dynamic Insertion and Removal	The ability to attach and remove devices while the host is in operation.
E^2PROM	See EEPROM.
EEPROM	Electrically Erasable Programmable Read Only Memory. Non-volatile rewritable memory storage technology.
End User	The user of a host.
Endpoint	See Device Endpoint.
Endpoint Address	The combination of a Device Address and an Endpoint Number on a Universal Serial Bus device.
Endpoint Number	A unique pipe endpoint on a Universal Serial Bus device.
EOF1	End of frame timing point #1. Used by the hub to monitor and disconnect bus activity persisting near or past the end of a frame.

EOF2	End of frame timing point #2. Used by hubs to detect bus activity near the end of frame.
EOP	End of packet.
Fs	See Sample Rate.
False EOP	A spurious, usually noise induced, event that is interpreted by a packet receiver as an end of packet.
FireWire	Apple Computer's implementation of the IEEE P1394 bus standard.
Frame	The time from the start of one SOF token to the start of the subsequent SOF token; consists of a series of transactions.
Frame Pattern	A sequence of frames that exhibit a repeating pattern in the number of samples transmitted per frame. For a 44.1 kHz audio transfer, the frame pattern could be nine frames containing 44 samples followed by one frame containing 45 samples.
Full-duplex	Computer data transmission occurring in both directions simultaneously.
Function	A Universal Serial Bus device that provides a capability to the host. For example, an ISDN connection, a digital microphone, or speakers.
GeoPort	A serial bus developed by Apple Computer, Inc. Current specification of the GeoPort supports data transfer rates up to 2 Mbs and provides point to point connectivity over a radius of 4 ft.
Handshake Packet	Packet which acknowledges or rejects a specific condition. For examples, see ACK and NACK.
Host	The host computer system where the Universal Serial Bus host controller is installed. This includes the host hardware platform (CPU, bus, etc.) and the operating system in use.
Host Controller	The host's Universal Serial Bus interface.
Host Controller Driver	The Universal Serial Bus software layer that abstracts the host controller hardware. Host Controller Driver provides an SPI for interaction with a host controller. Host Controller Driver hides the specifics of the host controller hardware implementation.
Host Resources	Resources provided by the host, such as buffer space and interrupts. See Device Resources and Universal Serial Bus Resources.
Hub	A Universal Serial Bus device that provides additional connections to the Universal Serial Bus.
Hub Tier	The level of connect within a USB network topology given as the number of hubs that that the data has to flow through.
I^2C	Acronym for the Inter-Integrated Circuits serial interface. The I^2C interface was invented by Philips Semiconductors.
IEEE P1394	A high performance serial bus. The P1394 is targeted at hard disk and video peripherals, which may require bus bandwidth in excess of 100 Mb/s. The bus protocol supports both isochronous and asynchronous transfers over the same set of four signal wires.
Industry Standard Architecture	The 8 and/or 16 bit expansion bus for IBM AT or XT compatible computers.

Integrated Services Data Network	An internationally accepted standard for voice, data, and signaling using public, switched telephone networks. All transmissions are digital from end-to-end. Includes a standard for out-of-band signaling and delivers significantly higher bandwidth than POTS.
Interrupt Request	A hardware signal that allows a device to request attention from a host. The host typically invokes an interrupt service routine to handle the condition which caused the request.
Interrupt Transfer	One of four Universal Serial Bus Transfer Types. Interrupt transfers characteristics are small data, non periodic, low frequency, bounded latency, device initiated communication typically used to notify the host of device service needs.
IRQ	See Interrupt Request.
ISA	See Industry Standard Architecture.
ISDN	See Integrated Services Data Network.
Isochronous Data	A stream of data whose timing is implied by its delivery rate.
Isochronous Device	An entity with isochronous endpoints, as defined in the USB specification, that sources or sinks sampled analog streams or synchronous data streams.
Isochronous Sink Endpoint	An endpoint that is capable of consuming an isochronous data stream.
Isochronous Source Endpoint	An endpoint that is capable of producing an isochronous data stream.
Isochronous Transfer	One of four Universal Serial Bus Transfer Types. Isochronous transfers are used when working with isochronous data. Isochronous transfers provide periodic, continuous communication between host and device.
Jitter	A tendency toward lack of synchronization caused by mechanical or electrical changes. More specifically, the phase shift of digital pulses over a transmission medium.
kbs	Transmission rate expressed in kilobits per second.
kBs	Transmission rate expressed in kilobytes per second.
Line Printer Port	A port used to access a printer. On most personal computers, an eight-bit parallel interface is typically used.
Little Endian	Method of storing data that places the least significant byte of multiple byte values at lower storage addresses. For example, a word stored in little endian format places the least significant byte at the lower address and the most significant byte at the next address. See big endian.
LOA	Loss of bus activity characterized by a start of packet without a corresponding end of packet.
LPT Port	See Line Printer Port.
LSB	Least Significant Bit.
Mbs	Transmission rate expressed in megabits per second.
MBs	Transmission rate expressed in megabytes per second.

Message Pipe	A pipe that transfers data using a request/data/status paradigm. The data has an imposed structure which allows requests to be reliably identified and communicated.
Micro Channel Architecture	Thirty-two bit expansion bus used on some IBM PS/2 compatible computers.
Modem	Acronym for Modulator/Demodulator. Component that converts signals between analog and digital. Typically used to send digital information from a computer over a telephone network which is usually analog.
MSB	Most Significant Bit.
NACK	Negative Acknowledgment. Handshake packet indicating a negative acknowledgment.
Non Return to Zero Invert	Method of encoding serial data in which ones and zeroes are represented by opposite and alternating high and low voltages where there is no return to zero (reference) voltage between encoded bits. Eliminates the need for clock pulses.
NRZI	See Non Return to Zero Invert.
Object	Host software or data structure representing a Universal Serial Bus entity.
Packet	A bundle of data organized in a group for transmission. Packets typically contain three elements: control information (e.g., source, destination, and length), the data to be transferred, and error detection and correction bits.
Packet Buffer	The logical buffer used by a Universal Serial Bus device for sending or receiving a single packet. This determines the maximum packet size the device can send or receive.
Packet ID	A field in a Universal Serial Bus packet that indicates the type of packet, and by inference the format of the packet and the type of error detection applied to the packet.
PBX	See Private Branch eXchange.
PCI	See Peripheral Component Interconnect.
PCMCIA	See Personal Computer Memory Card Industry Association.
Peripheral Component Interconnect	A 32- or 64-bit, processor independent, expansion bus used on personal computers.
Personal Computer Memory Card International Association	The organization that standardizes and promotes PC Card technology.
Phase	A token, data, or handshake packet; a transaction has three phases.
Physical Device	A device that has a physical implementation.; e.g. speakers, microphones, and CD players.
PID	See Packet ID.
Pipe	A logical abstraction representing the association between an endpoint on a device and software on the host. A pipe has several attributes; for example, a pipe may transfer data as streams (Stream Pipe) or messages (Message Pipe).

Plain Old Telephone Service	Basic service supplying standard single line telephones, telephone lines, and access to public switched networks.
Plug and Play	A technology for configuring I/O devices to use non-conflicting resources in a host. Resources managed by Plug and Play include I/O address ranges, memory address ranges, IRQs, and DMA channels.
PnP	See Plug and Play.
Polling	Asking multiple devices, one at a time, if they have any data to transmit.
POR	See Power On Reset.
Port	Point of access to or from a system or circuit. For Universal Serial Bus, the point where a Universal Serial Bus device is attached.
POTS	See Plain Old Telephone Service.
Power On Reset	Restoring a storage device, register, or memory to a predetermined state when power is applied.
PLL	Phase Locked Loop. A circuit that acts as a phase detector to keep an oscillator in phase with an incoming frequency.
Private Branch eXchange	A privately owned telephone switching system which is not regulated as part of the public telephone network.
Programmable Data Rate	Either a fixed data rate (single frequency endpoints), a limited number of data rates (32 kHz, 44.1 kHz, 48 kHz, …), or a continuously programmable data rate. The exact programming capabilities of an endpoint must be reported in the appropriate-class specific endpoint descriptors.
Protocol	A specific set of rules, procedures, or conventions relating to format and timing of data transmission between two devices.
RA	See Rate Adaptation.
Rate Adaptation (RA)	The process by which an incoming data stream, sampled at Fs_i is converted to an outgoing data stream, sampled at Fs_o with a certain loss of quality, determined by the rate adaptation algorithm. Error control mechanisms are required for the process. Fs_i and Fs_o can be different and asynchronous. Fs_i is the input data rate of the RA; Fs_o is the output data rate of the RA.
Request	A request made to a Universal Serial Bus device contained within the data portion of a SETUP packet.
Retire	The action of completing service for a transfer and notifying the appropriate software client of the completion.
Root Hub	A Universal Serial Bus hub attached directly to the host controller. This hub is attached to the host; tier 0.
Root Port	The upstream port on a hub.
Sample	Smallest unit of data on which an endpoint operates; a property of an endpoint.
Sample Rate (Fs)	Number of samples per second, expressed in Hertz.
Sample Rate Conversion (SRC)	A dedicated implementation of the RA process for use on sampled analog data streams. The error control mechanism is replaced by interpolating techniques.
SCSI	See Small Computer Systems Interface.

Service	A procedure provided by an SPI.
Service Interval	The period between consecutive requests to a Universal Serial Bus endpoint to send or receive data.
Service Jitter	The deviation of service delivery from its scheduled delivery time.
Service Rate	The number of services to a given endpoint per unit time.
Small Computer Systems Interface	A local I/O bus that allows peripherals to be attached to a host using generic system hardware and software.
SOF	An acronym for Start of Frame. The SOF is the first transaction in each frame. SOF allows endpoints to identify the start of frame and synchronize internal endpoint clocks to the host.
SPI	See System Programming Interface.
SRC	See Sample Rate Conversion.
Stage	One part of the sequence composing a control transfer; i.e., the setup stage, the data stage, and the status stage.
Stream Pipe	A pipe that transfers data as a stream of samples with no defined Universal Serial Bus structure.
Synchronization type	A classification that characterizes an isochronous endpoint's capability to connect to other isochronous endpoints.
Synchronous RA	The incoming data rate, $Fs_{i,}$ and the outgoing data rate, $Fs_{o,}$ of the RA process are derived from the same master clock. There is a fixed relation between Fs_i and Fs_o.
Synchronous SRC	The incoming sample rate, $Fs_{i,}$ and outgoing sample rate, $Fs_{o,}$ of the SRC process are derived from the same master clock. There is a fixed relation between Fs_i and Fs_o.
System Programming Interface	A defined interface to services provided by system software.
TDM	See Time Division Multiplexing.
Termination	Passive components attached at the end of cables to prevent signals from being reflected or echoed.
Time Division Multiplexing	A method of transmitting multiple signals (data, voice, and/or video) simultaneously over one communications medium by interleaving a piece of each signal one after another.
Time-out	The detection of a lack of bus activity for some predetermined interval.
Token Generator	See Initiator.
Token Packet	A type of packet that identifies what transaction is to be performed on the bus.
Transaction	The delivery of service to an endpoint; consists of a token packet, optional data packet, and optional handshake packet. Specific packets are allowed/required based on the transaction type.
Transfer	One or more bus transactions to move information between a software client and its function.

Transfer Type	Determines the characteristics of the data flow between a software client and its function. Four Transfer types are defined: control, interrupt, bulk, isochronous.
Turnaround Time	The time a device needs to wait to begin transmitting a packet after a packet has been received to prevent collisions on Universal Serial Bus. This time is based on the length and propagation delay characteristics of the cable and the location of the transmitting device in relation to other devices on Universal Serial Bus.
Universal Serial Bus	A collection of Universal Serial Bus devices and the software and hardware that allow them to connect the capabilities provided by functions to the host.
Universal Serial Bus Device	Includes hubs and functions. See device.
Universal Serial Bus Interface	The hardware interface between the Universal Serial Bus cable and a Universal Serial Bus device. This includes the protocol engine required for all Universal Serial Bus devices to be able to receive and send packets.
Universal Serial Bus Resources	Resources provided by Universal Serial Bus, such as bandwidth and power. See Device Resources and Host Resources.
Universal Serial Bus Software	The host-based software responsible for managing the interactions between the host and the attached Universal Serial Bus devices.
USB	See Universal Serial Bus.
USBD	See Universal Serial Bus Driver.
Universal Serial Bus Driver	The host resident software entity responsible for providing common services to clients that are manipulating one or more functions on one or more Host Controllers.
Upstream	The direction of data flow towards the host. An upstream port is the port on a device electrically closest to the host that generates upstream data traffic from the hub. Upstream ports receive downstream data traffic.
Virtual Device	A device that is represented by a software interface layer; e.g., a hard disk with its associated device driver and client software that makes it able to reproduce an audio .WAV file.
WFEOF2	Wait for EOF2 point. One of the four hub repeater states.
WFEOP	Wait for end of packet. One of the four hub repeater states.
WFSOF	Wait for start of frame. One of the four hub repeater states.
WFSOP	Wait for start of packet. One of the four possible hub repeater states.
Word	A data element that is two bytes or 16 bits in size.